



# Linear actuator with track roller guidance system and toothed belt drive

MLF32-ZR, MLF52-ZR  
Fitting and maintenance manual

# Safety guidelines and symbols

## High product safety

Our products correspond to the current level of research and technology. If the bearing arrangement is designed correctly, the products are handled and fitted correctly and as agreed and if they are maintained as instructed, they do not give rise to any direct hazards.

## Follow instructions

This publication describes standard products. Since these are used in numerous applications, we cannot make a judgement as to whether any malfunctions will cause harm to persons or property. It is always and fundamentally the responsibility of the designer and user to ensure that all specifications are observed and that all necessary safety information is communicated to the end user. This applies in particular to applications in which product failure and malfunction may constitute a hazard to human beings.

## Definition of guidelines and symbols

The warning and hazard symbols are defined along the lines of ANSI Z535.6-2006.

The meaning of the guidelines is as follows:

**Warning** 

In case of non-compliance, death or serious injury may occur.

**Caution** 

In case of non-compliance, minor or slight injury will occur.



**Note!**

In case of non-compliance, damage or malfunctions in the product or the adjacent construction will occur.

There follows additional or more detailed information that must be observed.



Numbers within a circle are item numbers.



Squares with a shaded border are placed in front of instructions.



Tick marks indicate preconditions.

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# About this manual

## The purpose of this manual

This fitting and maintenance manual is valid exclusively for the linear actuators stated on the title page.

It describes the secure fitting and maintenance of the linear actuator.

## How to use the manual

- ☐ This manual should be read carefully in full before starting any fitting or maintenance work.
- ☐ The manual must be stored throughout the life of the linear actuator.
- ☐ Please ensure that the manual is accessible at all times to the target group.
- ☐ The manual must be forwarded to each subsequent owner or operator of the linear actuator or the machine or equipment in which the linear actuator is fitted.

## Note!

The text and illustrations in this manual cover, by way of an example, the linear actuator MLF32-ZR. For an explanation of the design, see page 10.

The information in this manual can be applied analogously to all variants of the linear actuators stated on the title page.

## Target group

The target group of this manual comprises the operator and trained skilled personnel charged with the fitting and maintenance of the linear actuators described.

# Safety guidelines for linear actuators

## Use for the intended purpose

All the linear actuators named on the title page are intended exclusively for moving machine components connected to the carriage.

Any other use is not for the intended purpose and is therefore impermissible. The Schaeffler Group accepts no liability for any damage or loss arising therefrom.

## General safety guidelines

- ☐ Any actions and methods that endanger the safety of human beings must not be carried out.
- ☐ In all fitting and maintenance work, the following must be observed:
  - all nationally valid and relevant specifications for the prevention of accidents
  - all generally recognised rules of safety practice and occupational medicine.

The linear actuators named on the title page are constructed in accordance with the current level of technology and the recognised rules of safety practice. Nevertheless, while they are being used the user or third parties may be put at risk or the linear actuator and other material assets may be impaired.

## Risk reduction

Risks can be reduced by observing the following points:

- ☐ The linear actuator should only be operated if it is free from technical defects.
- ☐ The linear actuator should only be used for the intended purpose and with an awareness of safety and hazards.
- ☐ If any malfunctions occur that have safety implications, the linear actuator must be stopped immediately and the malfunction rectified by a person with appropriate responsibility.

## Fundamental instructions

The assembly and fitting of the linear actuator as well as the fitting and dismantling of the individual components must only be carried out as described in this manual:

- ☐ Carry out the operations in the specified sequence.
- ☐ Use the listed tools and fitting accessories correctly.  
Tools and fitting accessories that are unsuitable, damaged or contaminated will impair the function of the linear actuator.
- ☐ Screws must only be tightened using a torque wrench and the specified torques must be observed.
- ☐ Use rubber hammers only, not metal hammers.
- ☐ Do not use pointed or sharp-edged tools.

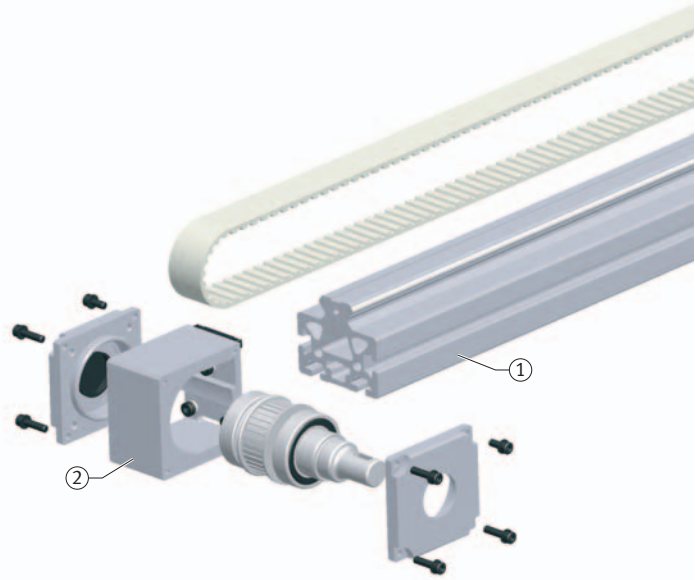
<b>Personnel selection and qualification</b>	Persons charged with the fitting and maintenance of the linear actuator must have adequate qualification. They must receive appropriate training and instruction before carrying out fitting or maintenance work.
<b>Providing information to personnel</b>	The fitting and maintenance manual must be available in a suitable form to the nominated persons (for example as a printout). This includes drawing explicit attention to the hazard and safety guidelines in this manual.
<b>Disclaimer of liability</b>	<p>The Schaeffler Group does not accept any liability for harm to human beings, the linear actuator and the adjacent construction that can be attributed to:</p> <ul style="list-style-type: none"> <li>■ incorrect fitting</li> <li>■ incorrect or inadequate maintenance</li> <li>■ incorrect communication of the content to third parties or a failure to communicate the content.</li> </ul>
<b>Use of replacement parts</b>	<p>Special INA replacement parts have been developed for the linear actuators named on the title page. These ensure the reliable and long term function of the linear actuator.</p> <p><input type="checkbox"/> Do not use replacement parts other than original replacement parts from the Schaeffler Group, see page 48.</p>
<b>Use of products from other sources</b>	<p>The use of products from other sources instead of INA replacement parts can:</p> <ul style="list-style-type: none"> <li>■ change the characteristics of the linear actuator in a negative manner</li> <li>■ endanger users or third parties</li> <li>■ cause impairment to the linear actuator and other material assets.</li> </ul>
<b>Disclaimer of liability</b>	The Schaeffler Group accepts no liability for any damage or loss arising from the use of products from other sources.

# Overview of the linear actuator

- ① Support rail with raceway shafts
- ② Drive unit  
(return unit on drive side)
- ③ Toothed belt unit
- ④ Lubrication and wiper unit
- ⑤ Carriage with profiled track rollers
- ⑥ Return unit  
(return unit on non-driven side)

*Figure 1*  
Subassemblies  
of linear actuator MLF32-ZR

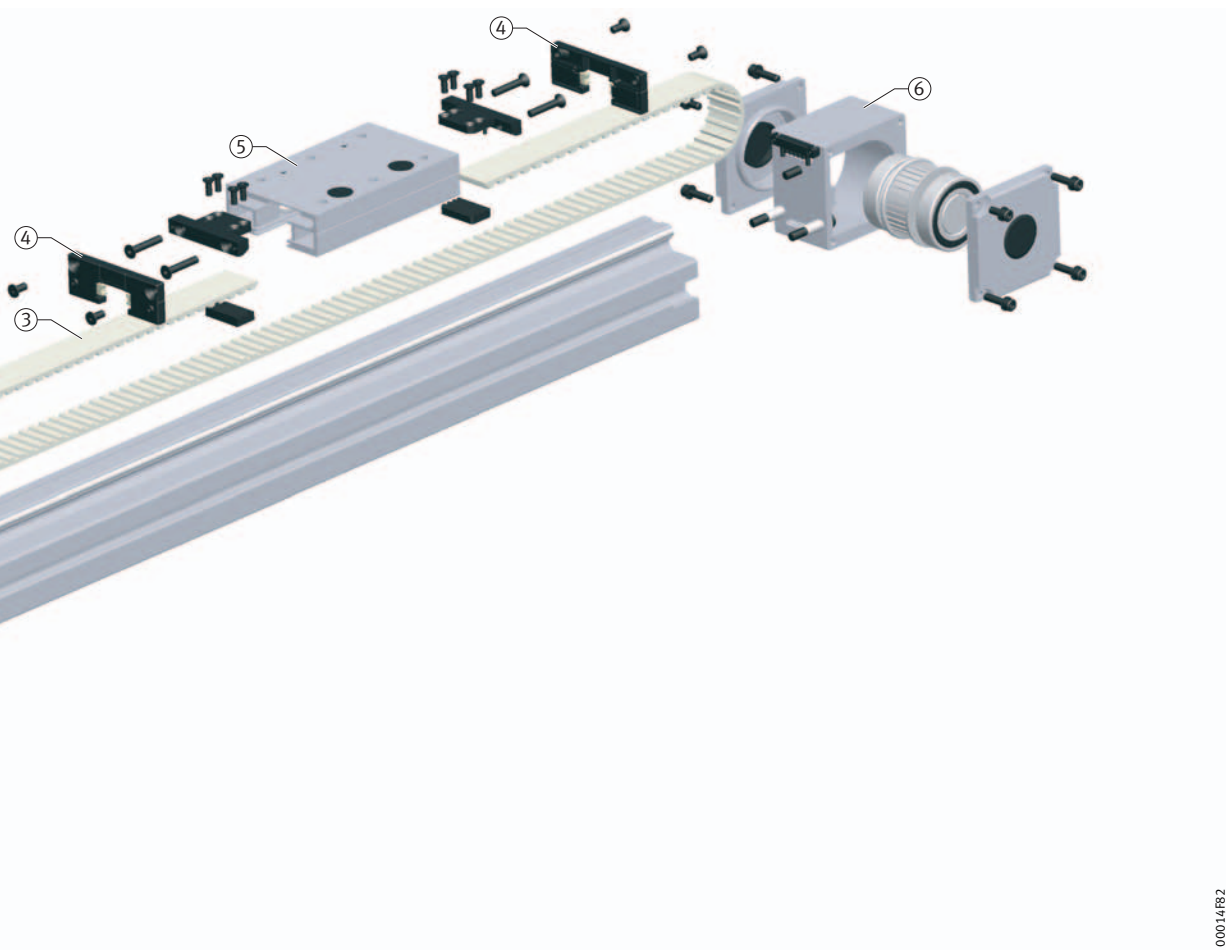
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## Included in delivery

- Support rail with raceway shafts ①  
If supplied in several pieces, see section Variants, page 42
- Drive unit ②





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#### Scope of delivery – continued

- Toothed belt unit ③  
Toothed belt and toothed belt clamping devices:  
The toothed belt is fixed to the carriage by means of the two clamping devices.
- Carriage with profiled track roller ⑤  
and lubrication and wiper units ④
- Return unit ⑥

# Overview of the linear actuator

## Available designs

### Track roller guidance system

The linear actuator is available in different designs.

Track roller guidance system	Series
Size 32	MLF32
Size 52	MLF52-130
	MLF52-145
	MLF52-155

### Carriage

Carriage		Suffix in ordering designation
Number of driven carriages		
1		–
2		Variant, see page 44
Length		
MLF32-ZR	155 mm	–
	300 mm	300
MLF52-130-ZR	200 mm	–
	300 mm	300
MLF52-145-ZR	245 mm	–
	500 mm	500
MLF52-155-ZR	260 mm	–
	500 mm	500

### Drive system

Drive system	Suffix in ordering designation
Without drive	OA
Drive shaft on right side	AR
Drive shaft on left side	AL
Drive shaft on both sides (right and left)	RL
Without drive shaft	OZ

### Support rail

Support rail	Suffix in ordering designation
Single-piece	–
Multi-piece	Variant, see page 44

### Note!

The text and illustrations in this manual cover, by way of an example, the following design of linear actuator:

- track roller guidance system of size 32 (MLF32)
- driven carriage 155 mm long
- drive shaft on the left side (AL).

The information in this manual can be applied analogously to all variants of the linear actuators stated on the title page.

The precise design of your linear actuator is dependent on your order.

## Ordering designation

The ordering numbers can be found engraved on the drive or return unit.

### Ordering example 1 Design

Linear actuator with track roller guidance system	MLF
Size	32
Drive type: one toothed belt	ZR
Drive shaft on left side	AL
Number of carriages	1
Support rail	Single-piece
Total length of actuator	5 000 mm
Stroke length of actuator	4 673 mm

**Ordering number**    **MLF32-ZR-AL/5 000-4 673**

### Ordering example 2 Design

Linear actuator with track roller guidance system	MLF
Size	52
Carriage width	155 mm
Carriage length	500 mm
Drive type: one toothed belt	ZR
Drive shaft on left side	AL
Number of carriages	1
Support rail	Single-piece
Total length of actuator	2 600 mm
Stroke length of actuator	1 857 mm

**Ordering number**    **MLF52-155-500ZR-AL/2 600-1 857**

### Variants

Variants of the standard designs are shown in the section Variants, see page 44.

## Fitting to the adjacent construction

The linear actuator is fitted in two steps:

- the support rail is fixed to the adjacent construction
- the carriage is fixed to the adjacent construction.

**Note!** Linear actuators more than 8 m long have a **multi-piece** support rail. They are supplied in several pieces.

- If the linear actuator is supplied in several pieces, please observe the section Variants, see page 42.

### Fixing the support rail to the adjacent construction

The support rail can be fixed to the adjacent construction using the following accessories:

- clamping lugs, see page 13
- fixing brackets, see page 13
- T-nuts to DIN 508, see page 14
- T-bolts to DIN 787, see page 14
- T-strips, see page 14
- hexagonal nuts to DIN 934, see page 14.

**Note!** Under normal loads, fixing by means of clamping lugs fixing brackets or T-nuts, T-bolts etc. is normally sufficient.

### INA connecting brackets

Multi-axis handling systems comprising INA linear actuators can be constructed using INA connecting brackets.

Detailed information on the connecting brackets can be found in INA publication Fasteners and connecting brackets for linear actuators (TPI 153).



If linear actuators are not fixed in place correctly, this can damage the linear actuator itself and the adjacent construction.

- Note the maximum tightening torques for the fixing screws, see page 53.
- Note the maximum spacings for the fasteners.
- Ensure that the adjacent construction has adequate strength.

## Fixing the support rail by means of clamping lugs or fixing brackets

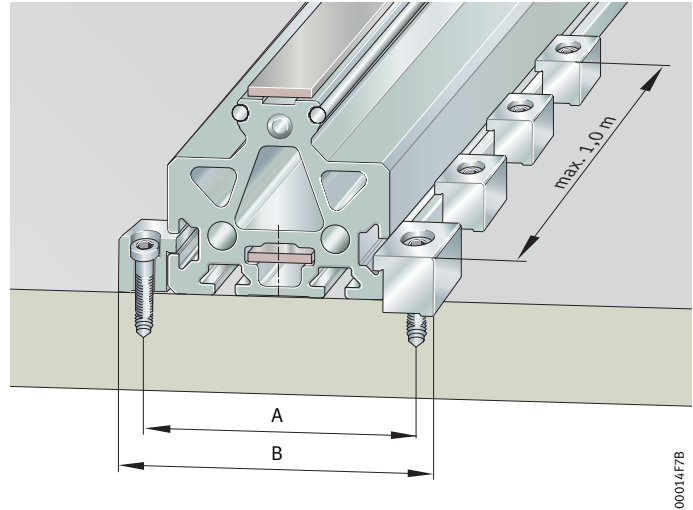
- If the support rail is fully in contact with the adjacent construction, clamping lugs or fixing brackets should be fitted on the left and right sides of the support rail at intervals of max. 333 mm.

MLF32-ZR:  
A = 100 mm  
B = 125 mm

MLF52-ZR:  
A = 137 mm  
B = 162 mm

*Figure 2*

Fixing by means of clamping lugs



- Under high loads, the support rail should be fixed at shorter intervals or additionally by means of T-nuts or other accessories named on page 12.

## Fitting to the adjacent construction

## Fixing the support rail by means of T-nuts

- ❑ If the support rail is fully in contact with the adjacent construction, T-nuts should be fitted in both profiled slots at intervals of max. 300 mm.

### Note!

The following accessories can be used instead of T-nuts:

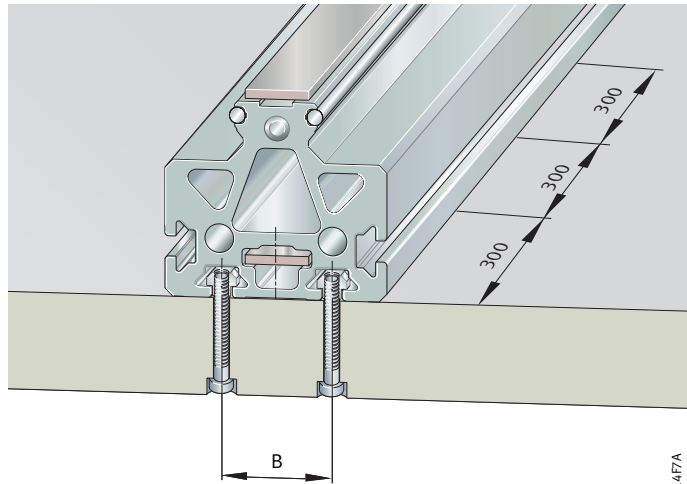
- T-bolts
- T-strips with appropriate spacing of the screws
- hexagonal nuts.

MLF32-ZR:  
B = 43 mm

MLF52-ZR:  
B = 80 mm

*Figure 3*

### Fixing by means of T-nuts



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- ❑ Under high loads, the support rail should be fixed at shorter intervals or additionally by means of clamping lugs or fixing brackets.

## Fixing the carriage to the adjacent construction

The carriage is fixed by means of:

- threaded rods
- grub screws.



If linear actuators are not fixed in place correctly, this can damage the linear actuator itself and the adjacent construction.

- ☐ Note the maximum tightening torques, see page 53.
- ☐ Ensure that the adjacent construction has adequate strength.
- ☐ Protect the raceway of the carriage against contamination.

## Fixing the carriage

- ☐ Carriages must be fixed to the adjacent construction in accordance with the loads and the forces acting on them.

## Fitting and mounting of accessories

For the linear actuators stated on the title page, the Schaeffler Group offers specially developed accessories, see section Appendix, page 51.

This section shows the fitting of the following accessories:

- coupling
- coupling housing.

### Coupling

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

### Warning

Sudden start of the machine.

Crushing of fingers between the linear actuator and machine parts.

- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

### Fitting the coupling

- ☐ Slide the coupling onto the drive shaft of the drive unit. There must be a gap of approx. 2 mm left between the coupling and the bearing cover.
- ☐ Fully tighten the fixing screw. The fixing screw and tightening torque will differ according to the coupling used, for information see INA publication ALE, Driven Linear Units.



Figure 4

Screw mounting of the coupling

### Removing the coupling

- ✓ Coupling housing removed.
- ☐ Loosen the fixing screw.
- ☐ Remove the coupling in the direction of the drive shaft.



## Coupling housing

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

### Warning

Sudden start of the machine.

Crushing of fingers between the linear actuator and machine parts.

- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

## Fitting the coupling housing

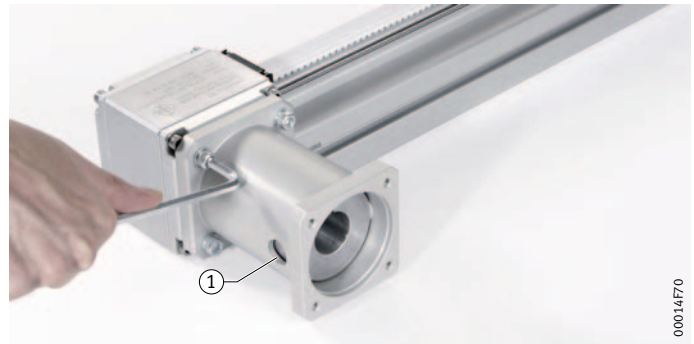
✓ Coupling fitted.

- ☐ Slide the coupling housing over the coupling. The hole in the coupling housing must face towards the adjacent construction, see *Figure 5*.
- ☐ Screw mount the coupling housing to the drive unit by means of the fixing screws.
  - MLF32-ZR: M6/9,5 Nm
  - MLF52-ZR: M8/23 Nm

① Hole in the coupling housing

*Figure 5*

Screw mounting of the coupling housing



### Note!

The hole in the coupling housing is used to fix and loosen the drive shaft (motor side).

## Removing the coupling housing

- ☐ Loosen the fixing screws.
- ☐ Remove the coupling housing in the direction of the drive shaft.

# Maintenance

## Maintenance requirements

Maintenance work is restricted to:

- relubrication
- cleaning.

Maintenance work may require the removal and refitting of components, see page 22 onwards.

## Visual inspection

In order to ensure exact function and a long operating life of the linear actuator, it must be visually inspected for damage and contamination at regular intervals.

## Maintenance intervals

Maintenance intervals, especially the intervals between relubrication, are influenced by:

- the travel speed/drive torque
- the load
- the temperature
- the stroke length
- the environmental conditions (cleanliness etc.).

## Maintenance according to operating conditions

It is not possible to calculate all the influences on maintenance intervals. The intervals can therefore only be determined precisely under operating conditions.

### Note!

The interval lengths stated in the following sections are **maximum** maintenance intervals. They must be shortened for each individual case depending on the types of influences present.

## Relubrication

Relubrication is necessary for:

- carriages.

### When should relubrication be carried out?

The relubrication interval is dependent on the environmental conditions. Relubrication times and quantities can only be determined precisely under operating conditions.

Relubrication must be carried out:

- as a function of the application. This must be determined in accordance with the operating conditions.
- as soon as fretting corrosion<sup>1)</sup> occurs.

#### Note!

If fretting corrosion occurs, the lubrication intervals should definitely be reduced.

### What should be used for relubrication?

For relubrication of the carriage, oils CL and CLP to DIN 51 517 with a viscosity of ISO-VG 220 are recommended.

#### Note!

Detailed information on recommended lubricants can be found in the INA publication ALE, Driven Linear Units. The INA publication can be requested through [info.linear@schaeffler.com](mailto:info.linear@schaeffler.com).

### What is the relubrication quantity?

Guide values for the relubrication quantity are shown in the table.

#### Relubrication quantity for carriages

Series	Relubrication quantity for carriage (guide values)
MLF32-ZR	approx. 1 ml to 2 ml
MLF52-ZR	approx. 2 ml to 3 ml

#### Note!

It is more advisable to carry out relubrication at several points during the maintenance interval, using partial quantities in each case, than relubrication at the end of the interval using the entire quantity.

<sup>1)</sup> Fretting corrosion can be identified by a reddish discolouration of the raceway shafts or the outside surface of the track rollers.

# Maintenance

## Relubrication of carriages

The carriage is lubricated via felt inserts integrated in the carriage. Relubrication is carried out via the funnel type lubrication nipples on the carriage.

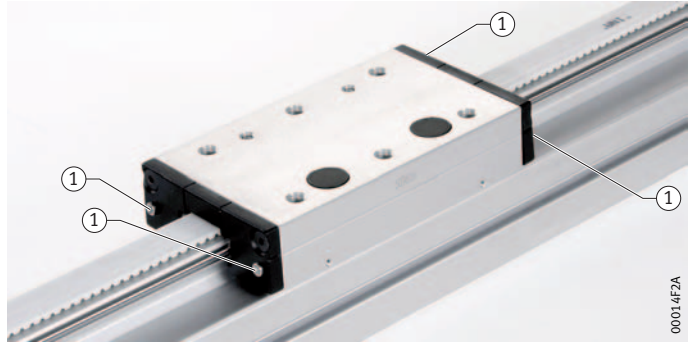
## Funnel type lubrication nipples

The funnel type lubrication nipples are located on the end faces of the lubrication and wiper units.

① Funnel type lubrication nipple

Figure 6

Funnel type lubrication nipples



### Note!

The relubrication quantity must be distributed equally to all four funnel type lubrication nipples.

### Warning

Sudden start of the machine.

Crushing of fingers between the carriage and machine parts.

- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

## Relubrication of carriages

- ✓ Linear actuator warm from operation.
- ✓ Funnel type lubrication nipples clean and accessible.
- ☐ Pump one quarter of the required lubricant quantity into each funnel type lubrication nipple. Ensure that all four funnel type lubrication nipples are supplied with oil.
- ☐ If possible, move the carriage by hand during lubrication in order to distribute the oil evenly.

## **Cleaning**

### **When should cleaning be carried out?**

Cleaning must be carried out if heavy contamination is present. The cleaning requirements are dependent on the environmental and application conditions and can only be determined in the operational state.

### **Cleaning of components after removal**

If components must be removed or the linear actuator must be dismantled, the components should be cleaned before refitting.



Damage due to unsuitable cleaning tools or cleaning agents.

- ☐ Do not use pointed, hard or abrasive objects.
- ☐ Do not dampen lubricated components during cleaning.
- ☐ Do not use abrasives, petroleum spirit, oil etc.

### **What should be used for cleaning?**

Suitable cleaning tools are:

- paint brush
- soft brush
- soft cloths.

# Removal and dismantling of components

## Linear actuator

The linear actuator is dismantled in the following sequence:

- remove the toothed belt, see page 23
- remove the drive unit or return unit, see page 26
- remove the carriage, see page 28.

## Note!

It is only necessary in exceptional cases to completely disassemble the linear actuator.

## Toothed belt unit

The toothed belt unit comprises the toothed belt and two clamping devices. The clamping devices connect the toothed belt to the carriage.

- ① Toothed belt
- Clamping device:
- ② Lower clamping piece
  - ③ Upper clamping piece
  - ④ Fixing screws
  - ⑤ Adjusting screws

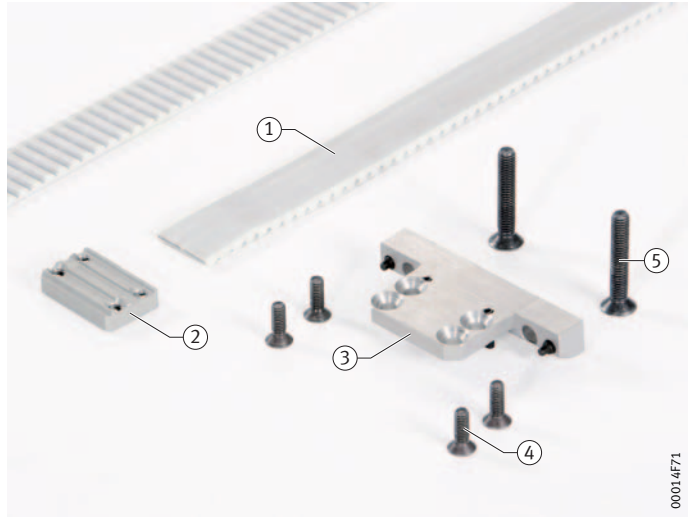


Figure 7

Overview of toothed belt unit



**Warning**

Sudden start of the machine.

Crushing of fingers between the carriage and machine parts.

- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

## Removing the toothed belt

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

### **Note!**

The toothed belt is supplied with a factory-specified preload. If the toothed belt is refitted after removal, it must be set to the same preload as before removal, see page 38.

Removing the lubrication and wiper unit

- ☐ Loosen the screws on the lubrication and wiper unit.



*Figure 8*

Loosening the lubrication and wiper unit

- ☐ Detach the lubrication and wiper unit carefully from the carriage and remove it from the support rail. During this operation, hold the retainers of the felt inserts securely in place.



*Figure 9*

Removing the lubrication and wiper unit

### **Note!**

The felt inserts may become detached during dismantling.

- ☐ Refit the felt inserts in the lubrication and wiper unit. Ensure that the springs are inserted as well.

## Removal and dismantling of components

Detaching the clamping device from the carriage

- Loosen and remove the adjusting screws.



*Figure 10*

Loosening the adjusting screws

- Remove the clamping device from the carriage.

Removing the clamping device from the toothed belt

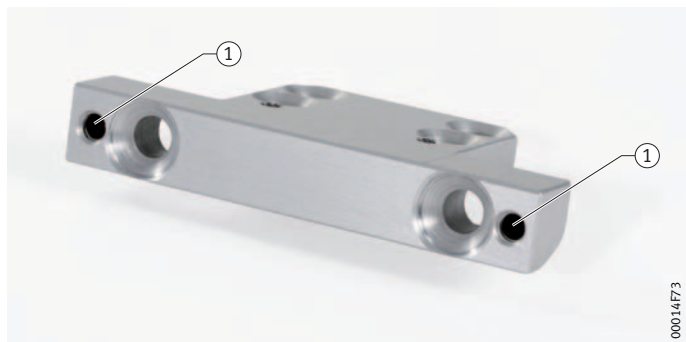
- Loosen and remove the fixing screws of the clamping device.



*Figure 11*

Loosening the fixing screws

- Remove the upper and lower clamping pieces from the toothed belt.
- If the same toothed belt is refitted: ensure that the grub screws on the upper clamping piece are screwed in to the same depth in order to achieve the original preload.



① Grub screw

*Figure 12*

Position of grub screws



Removing the second lubrication  
and wiper unit

- ❑ Detach the second lubrication and wiper unit from the carriage and remove it from the support rail.

Detaching the second clamping  
device from the carriage

**Note!**

- ❑ Detach the second clamping device from the carriage, but **do not** remove the clamping pieces from the toothed belt.

The second clamping device must only be removed from the toothed belt if the clamping device itself or the toothed belt must be replaced. It is not necessary to remove the second clamping device in order to remove the toothed belt unit.

Removing the toothed belt

- ❑ Grip the toothed belt by the clamping device and pull it out of the support rail.



*Figure 13*

Removing the toothed belt

# Removal and dismantling of components

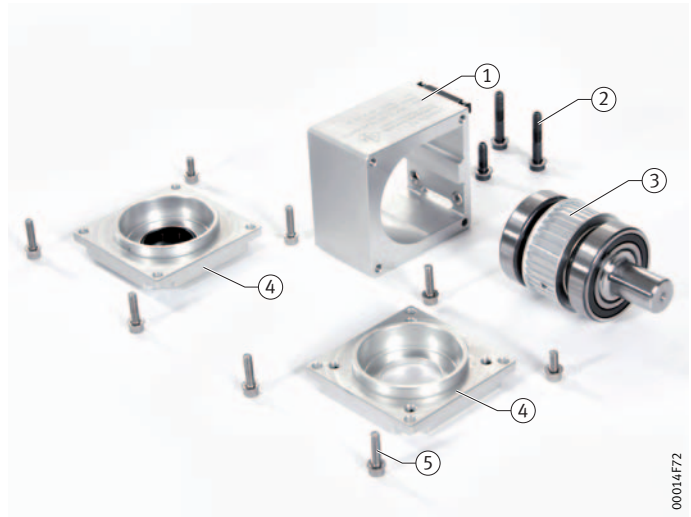
## Drive unit and return unit

The drive unit and return unit differ in their design. However, both components are dismantled in the same way.

- ① Housing
- ② Fixing screws for housing
- ③ Toothed belt pulley with bearing
- ④ Bearing cover
- ⑤ Fixing screws for bearing cover

*Figure 14*

Overview of drive unit



## Removing the drive unit or return unit

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

✓ Toothed belt removed, see page 23.

✓ In the case of the drive unit: Motor, coupling and coupling housing removed, see page 16 and page 17.

Removing the toothed belt pulley

- ☐ Loosen the fixing screws on one bearing cover on the drive unit or return unit as appropriate.
- ☐ Detach the bearing cover from the housing and slide it out in the direction of the shaft axis.



*Figure 15*

Removing the bearing cover

- ❑ If the toothed belt pulley was not slid completely out of the housing with the bearing cover, remove the toothed belt pulley completely from the housing with the bearing.



*Figure 16*  
Removing the toothed belt pulley

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Removing the housing

- ❑ Remove the second bearing cover from the housing.
- ❑ Loosen the fixing screws on the housing.



*Figure 17*  
Unscrewing the housing

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- ❑ Remove the housing from the support rail.



*Figure 18*  
Removing the housing

00014F5F

# Removal and dismantling of components

## Carriage

It is only necessary to remove the carriage if it is to be replaced by a new carriage.

- ① Saddle plate with profiled track rollers
- ② Lubrication and wiper unit
- ③ Felt inserts for relubrication
- ④ Fixing screws

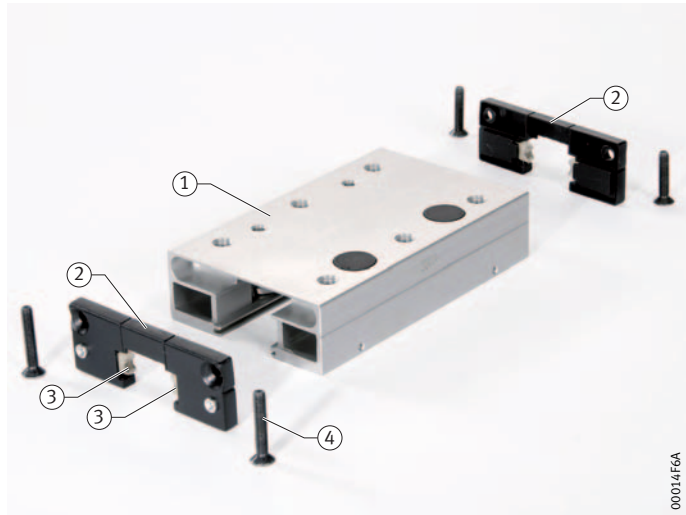


Figure 19

Overview of carriage



Damage due to contaminated lubricant.

The characteristics of oil may change due to contamination.

- ☐ The work area must be cleaned before removing the carriage.
- ☐ Elements with oil must be laid only on a clean, lint-free underlay.

## Removing the carriage



Damage due to incorrect removal.

- ☐ While removing the carriage, hold it concentric and parallel to the support rail.

Removing the carriage

- ☐ Remove the carriage carefully from the support rail.



Figure 20

Removing the carriage

# Fitting and mounting of components

## Linear actuator

A completely disassembled linear actuator is reassembled in the following sequence:

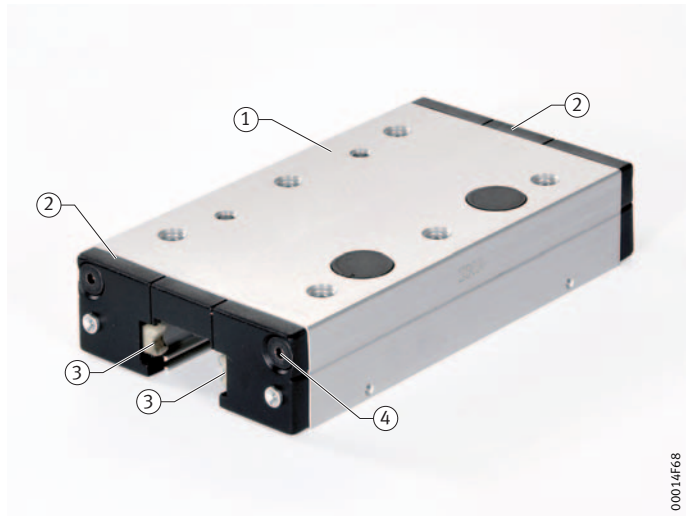
- fit the carriage, see page 31 to page 32
- insert the toothed belt, see page 33
- fit the return unit, see page 34 to page 35
- fit the drive unit, see page 36 to page 37
- fix the toothed belt to the carriage, see page 37
- preload the toothed belt, see page 38 to page 40
- fix the lubrication and wiper units to the carriage, see page 40.

# Fitting and mounting of components

## Carriage

- ① Saddle plate with profiled track rollers
- ② Lubrication and wiper unit
- ③ Felt inserts for relubrication
- ④ Fixing screws

*Figure 21*  
Overview of carriage  
(completely assembled)



The following tools are required:

- torque wrench
- Allen key or hex key inserts
- ring wrench.



Damage due to incorrect fitting.

- ☐ Hold the profiled track rollers with the correct fit at the level of the raceway shafts.
- ☐ Hold the carriage concentric and parallel to the support rail.
- ☐ Ensure that the carriage runs without clearance over the whole length of the support rail.
- ☐ After fitting, relubricate the carriage, see page 20.

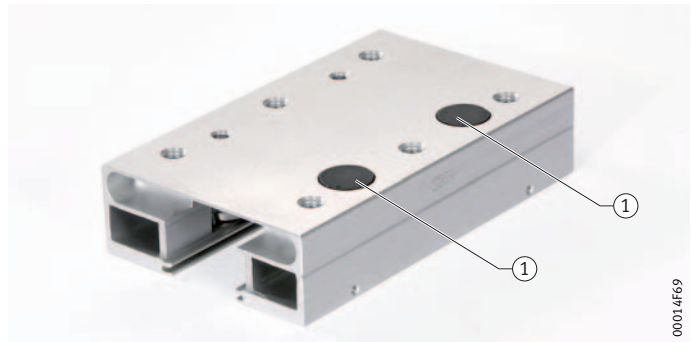
### Preparing the carriage

- ☐ Remove the lubrication and wiper units, see page 23.
- ☐ Remove the black protective caps on the eccentric bolts.

① Protective cap on eccentric bolt

*Figure 22*

Protective caps on eccentric bolts



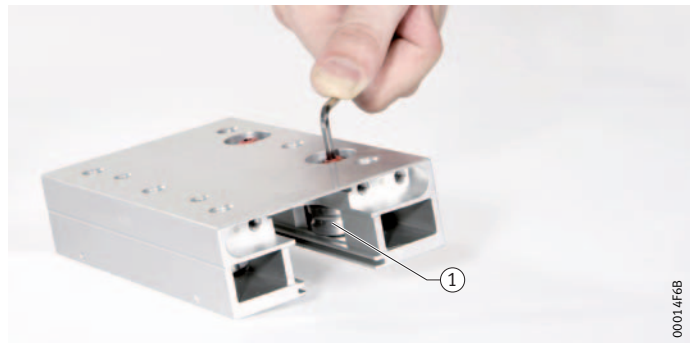
00014F69

- ☐ Loosen the nuts on the eccentric bolts until the eccentric bolts can be turned.
- ☐ Turn the profiled track rollers of the eccentric bolts towards the centre of the carriage.

① Profiled track roller with eccentric bolt

*Figure 23*

Turning the profiled track rollers towards the centre of the carriage



00014F68

### Sliding the carriage on

- ☐ Slide the carriage carefully onto the raceway shafts.

*Figure 24*

Sliding the carriage onto the raceway shafts



00014F62

## Fitting and mounting of components

### Setting the profiled track rollers clearance-free

- ❑ Turn the eccentric bolts until the carriage sits without clearance on the raceway shafts. Move the carriage by hand during this operation.



Figure 25

Turning the eccentric bolts

- ❑ Tighten the nuts on the eccentric bolts. Ensure that the eccentric bolt does not rotate as well.
  - MLF32-ZR: 15 Nm
  - MLF52-130-ZR and MLF52-145-ZR: 40 Nm
  - MLF52-155-ZR: 70 Nm



Figure 26

Tightening the nut on  
the eccentric bolt

- ❑ Move the carriage by hand and check whether it can move without clearance over the whole length of the support rail.

#### **Note!**

If the carriage **cannot** move without clearance over the whole length of the support rail, please contact Application Engineering at the Linear Technology Division.

### Fitting the protective caps

- ❑ Press the protective caps into the recesses for the eccentric bolts.



## Toothed belt unit

A component overview is shown in *Figure 7*, page 22

### Overview of fitting

The toothed belt is fitted in 6 steps:

- insert the toothed belt
- fit the return unit
- fit the drive unit
- fix the toothed belt to the carriage
- preload the toothed belt
- fit the lubrication and wiper units.

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts
- screwdriver.

### Note!

If the toothed belt is refitted after removal, it must be set to the same preload as before removal, see page 38.

### Starting point

The following instructions are based on the assumption that both the return unit and the drive unit have been removed, see page 26.

If only one of the two units has been removed, go directly to Fitting the drive unit housing, see page 36. In this case, the instructions also apply for fitting of the return unit.

✓ Carriage fitted, see page 31.

### Inserting the toothed belt

- ☐ Insert the toothed belt into the lower hollow section at the open end of the support rail. The teeth of the toothed belt must face upwards.



*Figure 27*

Inserting the toothed belt  
in the support rail

- ☐ Continue inserting the toothed belt until only 3 or 4 teeth protrude from the end of the support rail.

## Fitting and mounting of components

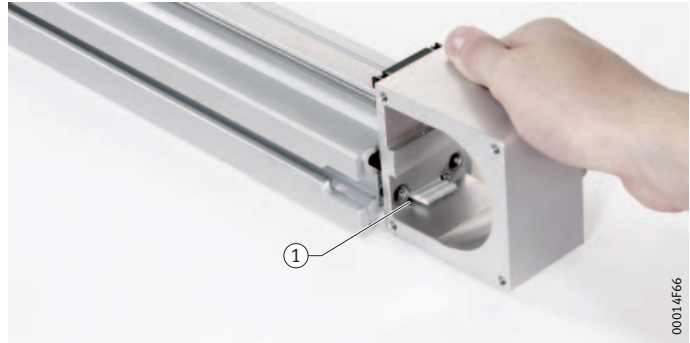
### Fitting the return unit housing

- ❑ Locate the return unit housing on the two dowel pins and push it onto the support rail until it stops. Ensure that the toothed belt slides through the lower opening into the housing.

① Opening for toothed belt

*Figure 28*

Locating the housing



- ❑ Screw mount the housing on the support rail using fixing screws:
  - MLF32-ZR: M6/9,5 Nm
  - MLF52-ZR: M8/23 Nm

**Note!** The shorter screw must be used for the upper, central hole.

*Figure 29*

Screw mounting of the housing



- ❑ Screw mount 1 bearing cover to the housing:
  - MLF32-ZR: M5/5,5 Nm
  - MLF52-ZR: M6/9,5 Nm

**Note!** The shorter screw must be used for the hole on the toothed belt wiper.

Fitting the toothed belt pulley

- ❑ Insert the toothed belt pulley into the housing.



Figure 30

Inserting the toothed belt pulley



Damage to the toothed belt and return unit due to unsuitable tools.

- ❑ Do not use pointed or sharp-edged tools.

Inserting the toothed belt

- ❑ Feed the toothed belt onto the teeth of the toothed belt pulley with the aid of a screwdriver. Hold the screwdriver flat between two teeth on the toothed belt.

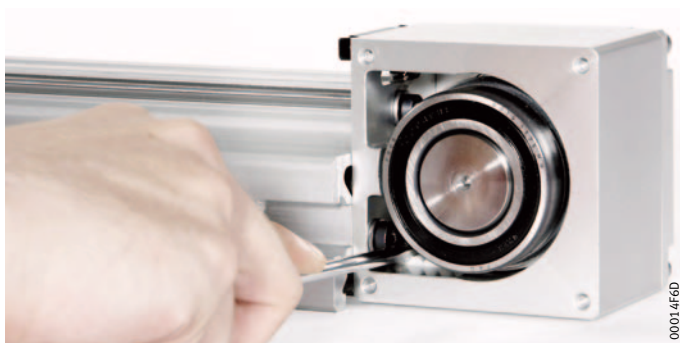


Figure 31

Feeding the toothed belt onto the toothed belt pulley

- ❑ Guide the toothed belt over the toothed belt pulley and pull it approx. 200 mm out of the top of the return unit.

Closing the return housing

- ❑ Locate the bearing cover and screw mount using fixing screws:
  - MLF32-ZR: M5/5,5 Nm
  - MLF52-ZR: M6/9,5 Nm

**Note!**

The shorter screw must be used for the hole on the toothed belt wiper.

## Fitting and mounting of components

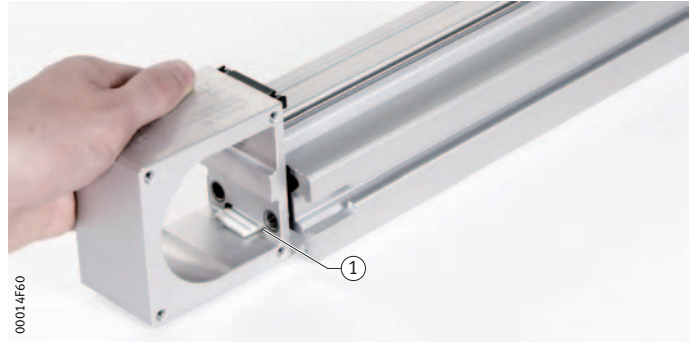
### Fitting the drive unit housing

- ❑ Draw the toothed belt out of the return unit until its other end protrudes by 3 or 4 teeth from the open end of the support rail.
- ❑ Locate the drive unit housing on the two dowel pins and push it onto the support rail until it stops. Ensure that the toothed belt slides through the lower opening into the housing.

① Opening for toothed belt

*Figure 32*

Locating the housing



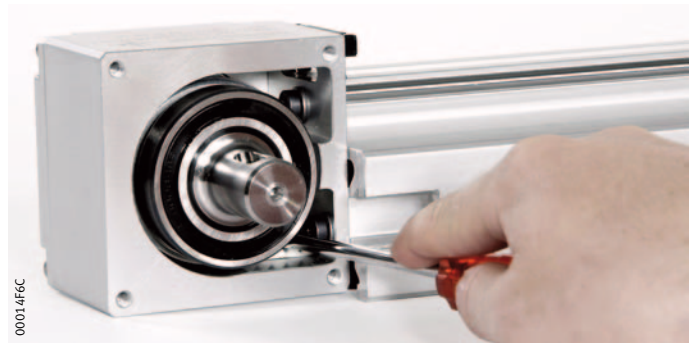
- ❑ Screw mount the housing on the support rail using fixing screws:
  - MLF32-ZR: M6/9,5 Nm
  - MLF52-ZR: M8/23 Nm
- ❑ 1 Screw mount 1 bearing cover to the housing:
  - MLF32-ZR: M5/5,5 Nm
  - MLF52-ZR: M6/9,5 Nm
- ❑ Insert the toothed belt pulley into the housing.

### Inserting the toothed belt

- ❑ Feed the toothed belt onto the teeth of the toothed belt pulley.

*Figure 33*

Feeding the toothed belt onto the toothed belt pulley



- ❑ Guide the toothed belt over the toothed belt pulley and pull it approx. 200 mm out of the top of the drive unit.

## Closing the drive unit housing

- ☐ Locate the bearing cover on the drive axis and slide it against the housing. If necessary, carefully knock the bearing cover into place using a rubber hammer.
- ☐ Insert fixing screws into the (outer) holes and screw mount the bearing cover:
 

– MLF32-ZR:	M5/5,5 Nm
– MLF52-ZR:	M6/9,5 Nm

### **Note!**

The inner holes on the drive unit are intended for the coupling housing.

## Fixing the clamping device to the toothed belt

- ☐ Position the toothed belt on the lower clamping piece. The toothed belt must completely cover the clamping piece. The bevelled corners of the clamping piece face towards the carriage.



Figure 34

Positioning the toothed belt on the lower clamping piece

- ☐ Screw mount the upper and lower clamping pieces of the first clamping device to the toothed belt:
 

– MLF32-ZR:	M4/2,7 Nm
– MLF52-ZR:	M5/5,5 Nm



Figure 35

Screw mounting the clamping device to the toothed belt

## Fitting and mounting of components

Fixing the toothed belt to the carriage

- ❑ Screw mount the clamping device to the carriage using the adjusting screw:
  - MLF32-ZR: M5/5,5 Nm
  - MLF52-ZR: M5/5,5 Nm



Figure 36

Screw mounting the clamping device to the carriage

- ❑ Screw mount the second clamping device to the toothed belt:
  - MLF32-ZR: M4/2,7 Nm
  - MLF52-ZR: M5/5,5 Nm
- ❑ Screw mount the clamping device to the carriage loosely enough that the toothed belt is **not** yet tensioned.

Preloading the toothed belt during refitting

When refitting a toothed belt that has been removed:

- ❑ tighten the clamping device to the hard stop.
  - MLF32-ZR: M5/5,5 Nm
  - MLF52-ZR: M5/5,5 Nm

**Note!**

- ❑ The grub screws on the upper clamping pieces must be screwed in to the same depth as they were before the toothed belt was removed. If they are screwed in to a different depth, the procedure to be followed must be the same as that for fitting a new toothed belt.

MLF32-ZR:  
① Grub screw M4

MLF52-ZR:  
① Grub screw M5

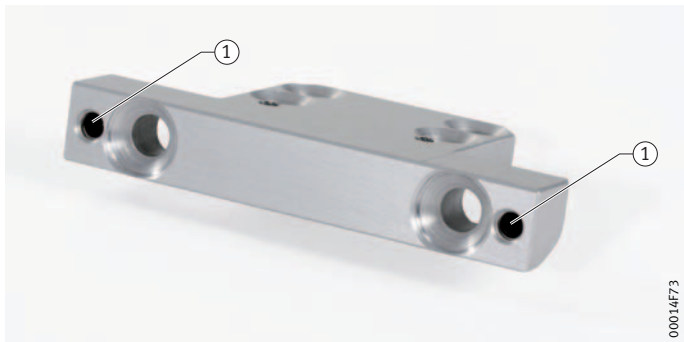


Figure 37

Position of grub screws

## Preloading a new toothed belt

When fitting a new toothed belt:

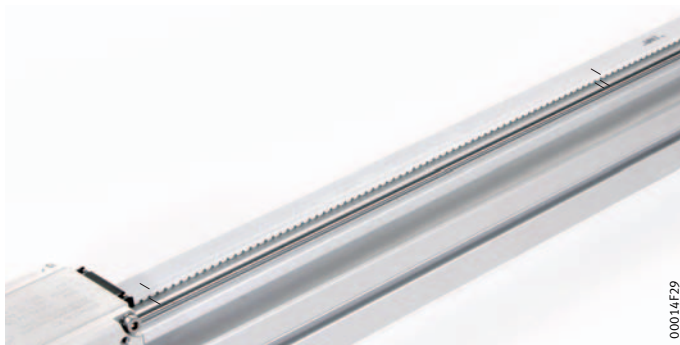
- ❑ Mark a measurement length of 1000 mm on the untensioned toothed belt. In order to increase the measurement accuracy, the measurement length can be extended in the case of longer linear actuators (2 000 mm, 3 000 mm etc.).

*Figure 38*  
Measurement length marked  
(not to scale)



- ❑ Tighten the adjusting screw on the second clamping device until the measurement length is extended by the preload elongation. The elongation is as follows:
  - MLF32-ZR: 2 mm/1000 mm
  - MLF52-ZR: 1,6 mm/1000 mm

*Figure 39*  
Measurement length preloaded  
(not to scale)



- ❑ If the clamping device cannot be recessed far enough in the carriage, undo the grub screws on the upper clamping piece as far as necessary. For the position of the grub screws, see *Figure 37*, page 38.

## Fitting and mounting of components

### Fixing the toothed belt preload

- ❑ Once the preload has been achieved, tighten the grub screws to the hard stop.
  - MLF32-ZR: M4/2,7 Nm
  - MLF52-ZR: M5/5,5 Nm

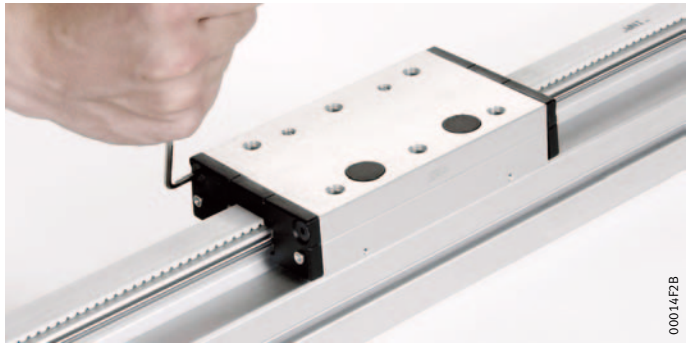


*Figure 40*  
Fixing the preload

- ❑ Check the correct preload using the measurement marks. Make corrections if necessary.

### Fixing the lubrication and wiper units to the carriage

- ❑ If the lubrication felt inserts are secured by means of rubber rings, remove the rubber rings.
- ❑ Position both lubrication and wiper units carefully on the support rail. Ensure that the lubrication felt inserts are correctly seated in the lubrication and wiper units.
- ❑ Screw mount the lubrication and wiper units to the carriage:
  - MLF32-ZR: M5/5,5 Nm
  - MLF52-ZR: M6/9,5 Nm



*Figure 41*  
Screw mounting of the lubrication  
and wiper unit



## **Drive unit and return unit**

A component overview is shown in *Figure 14*, page 26.

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts.

✓ Toothed belt inserted in the profiled section, see page 33.

## **Fitting the drive unit or return unit**

☐ For fitting of the drive unit, see page 36.

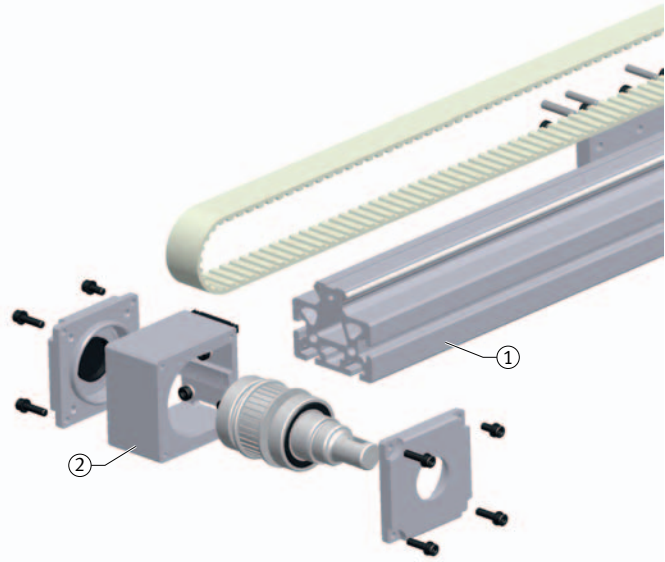
☐ For fitting of the return unit, see page 34.

## Variants

- ① Support rail with raceway shafts
- ② Drive unit  
(return unit on drive side)
- ③ Toothed belt unit
- ④ Lubrication and wiper unit
- ⑤ Carriage with profiled track rollers
- ⑥ Return unit  
(return unit on non-driven side)

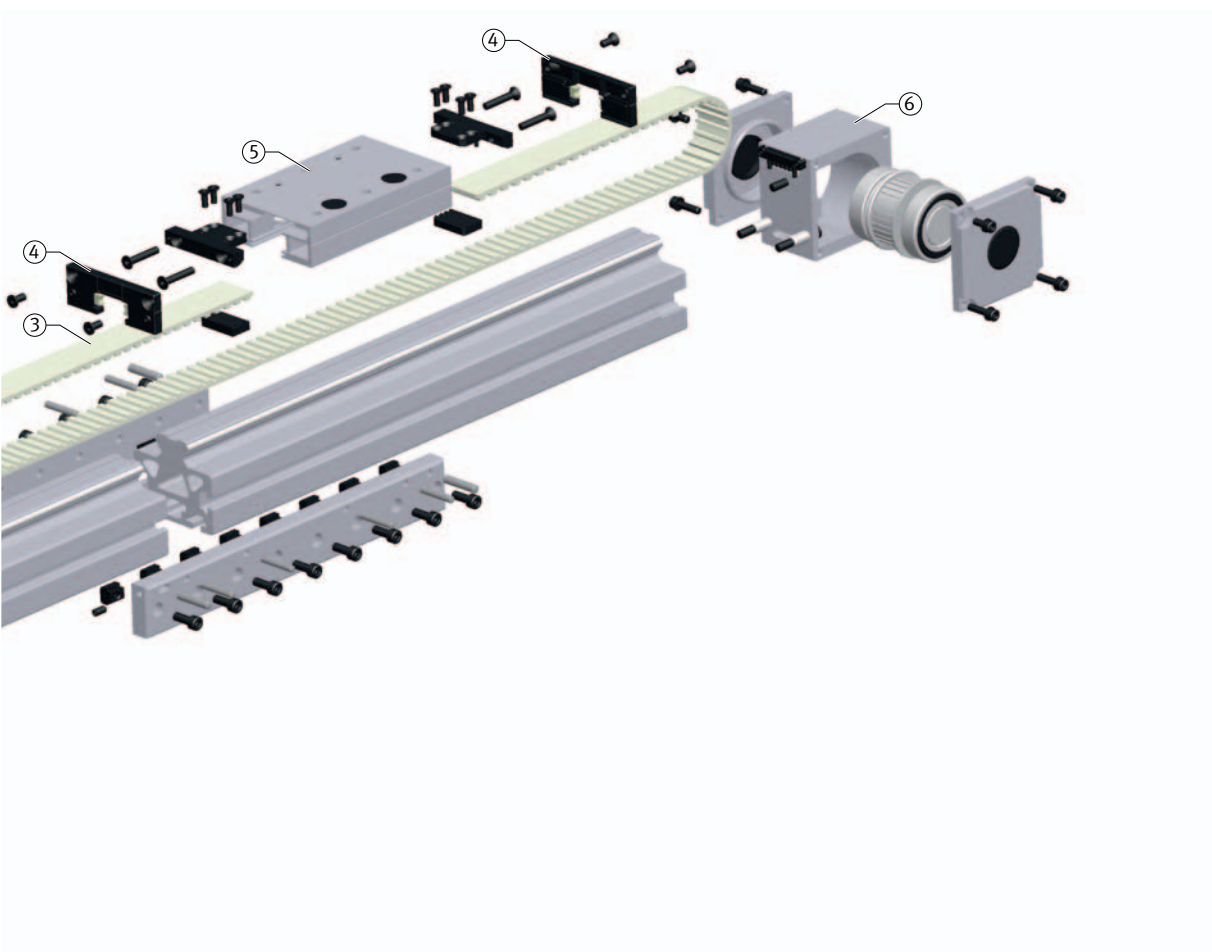
*Figure 42*  
Subassemblies  
of linear actuator MLF32-ZR,  
multi-piece design

00014/7E



### Subassemblies

- Multi-piece support rail with raceway shafts and retaining plates ①, two retaining plates supplied per profiled section joint
- Drive unit ②



#### Subassemblies – continued

- Toothed belt unit ③  
Toothed belt and toothed belt clamping devices:  
The toothed belt is fixed to the carriage by means of the two clamping devices
- Carriage with profiled track rollers ⑤  
and lubrication and wiper units ④
- Return unit ⑥

## Variants

### Available variants

Carriage	Suffix in ordering designation
2 driven carriages	W2
Support rail	Suffix in ordering designation
Multi-piece	FA517.X <sup>1)</sup>

<sup>1)</sup> X = number of support rail joints

### Ordering example Design

Linear actuator with track roller guidance system	MLF
Size	52
Width of carriage	155 mm
Length of carriage	500 mm
Drive type: one toothed belt	ZR
Drive shaft on both sides	RL
Two carriages	W2
Multi-piece support rail	FA517.1
Total length of actuator	10 000 mm
Stroke length of actuator	9 257 mm

### Ordering designation

**MLF52-155-500-ZR-RL-W2-FA517.1/10 000-9 257**

### Multi-piece support rail

Linear actuators more than 8 m long are supplied in several pieces. They must be assembled before fitting into the adjacent construction.

### Note!

If a delivery includes two or more multi-piece linear actuators, the individual pieces of each actuator are identified by the same letter on the joints of the profiled sections.

### Example

Linear actuator 1: A1, A2, A3, etc.  
Linear actuator 2: B1, B2, B3, etc.

## Assembling the support rail

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts.

### Caution

Risk of injury due to falling support rails.

- ☐ Ensure that support rails cannot drop from the working area.

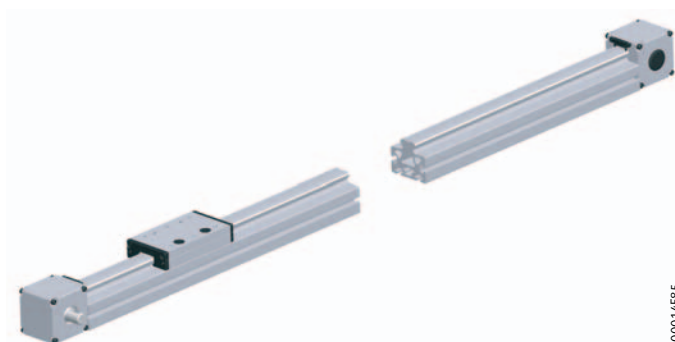
## Positioning of individual pieces

- ☐ The individual pieces of the support rail must be arranged consecutively in the correct sequence. The combinations of letters and numbers must match, see *Figure 44*.

### Example

Correct: profiled section joint A1 – A1

Incorrect: profiled section joint A1 – A2



*Figure 43*

Arranging the support rails

- ☐ Slide the T-nuts for the retaining plates into the T-slots in the sides.
- ☐ Slide the individual pieces of the support rail together.



*Figure 44*

Example of letter and number combination for profiled section joint

## Variants

Joining the individual pieces

- ❑ Locate the retaining plates at the centre of the profiled section joints using the fixing screws M6.



Figure 45

Locating the retaining plates

- ❑ Check whether the raceway shafts on the individual sections abut each other precisely. If necessary, correct the position of the individual pieces.
- ❑ Fix the retaining plates to the support rail by dowels using the two outermost dowel holes. Use the dowel holes in the support rail for this purpose.

**Note!**

The dowel hole at one end of the retaining plate is designed as a slot.



- ① Grub screw
- ② Slot

Figure 46

Grub screw and slot

- ❑ Tighten the grub screws at the slots to the abutment point.
- ❑ Check the joint location again.
- ❑ Fasten the fixing screws in the retaining plates to a torque of 9,5 Nm.
- ❑ Drill through the support rail at the remaining dowel holes in the retaining plates to a diameter 6 H7 and a depth of approx. 20 mm.
- ❑ Knock in the dowel pins.

Fitting the components

- ❑ For fitting of further components, see section Fitting and mounting of components, page 29.

## Multiple carriages

If the linear actuator has more than one carriage, these have a passage for the toothed belt and are free to move individually. They are connected to each other by means of the adjacent construction.

### Fitting of multiple carriages

The following tools are required:

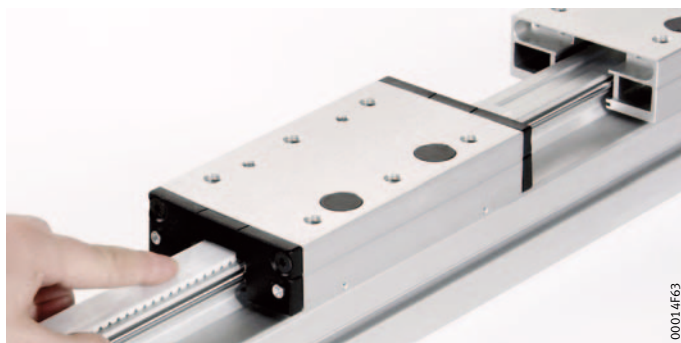
- rubber hammer
- torque wrench
- Allen key or hex key inserts
- screwdriver.

- ✓ All carriages slid onto raceway shafts, see page 31 to page 32.
- ✓ Toothed belt inserted but not yet fitted with clamping devices, see page 33 to page 37.
- ✓ Lubrication and wiper units fixed to the freely movable carriages, see page 40.

### Fitting the toothed belt

- ☐ Pass the toothed belt between the support rail and the underside of the freely movable carriages.

*Figure 47*  
Passing the toothed belt under the carriages



- ☐ Fix the toothed belt to the driven carriage, see page 37 to page 40.

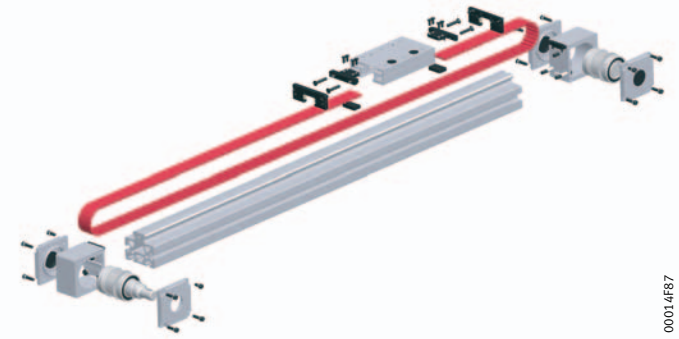
### Fixing the carriage to the adjacent construction

- ☐ Fix all carriages to the adjacent construction, see page 15.

# Replacement parts

**Note!** The precise design of your linear actuator is dependent on your order. When ordering replacement parts, please indicate the ordering number of your linear actuator. The ordering numbers can be found engraved on the drive unit or return unit.

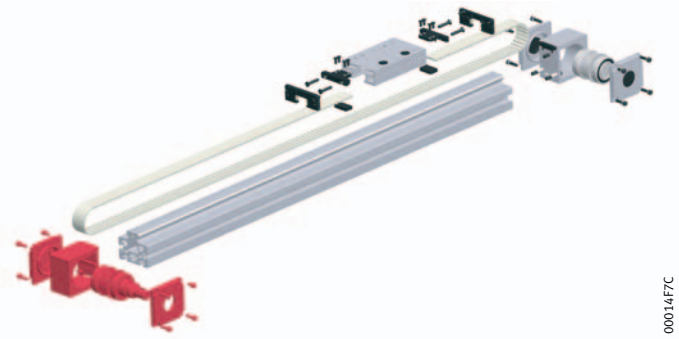
## Toothed belt



Replacement parts list for toothed belt

Linear actuator	Designation	MATNR
MLF32-ZR	ZHRI20-AT-5	000116742-0000
MLF52-ZR	ZHRI32-AT-10	000148814-0000

## Drive unit

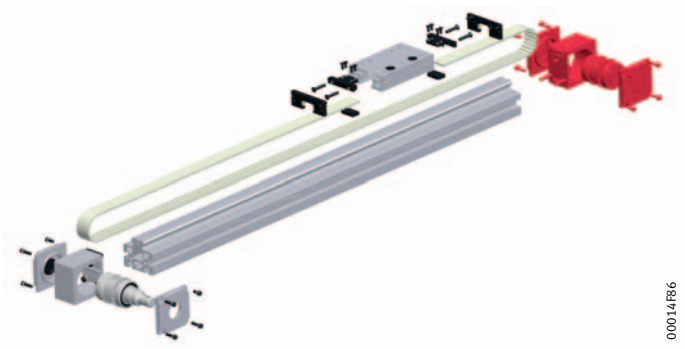


Replacement parts list for drive unit

Linear actuator	Designation	MATNR
Drive shaft on left or right side		
MLF32-ZR	UML.MLF32-ZR-AR-7500	000595861-0000
MLF52-ZR	UML.MLF52-ZR-AR-7500	000148792-0000
Drive shaft on both sides		
MLF32-ZR	UML.MLF32-ZR-RL-7500	000695505-0000
MLF52-ZR	UML.MLF52-ZR-RL-7500	000362344-0000



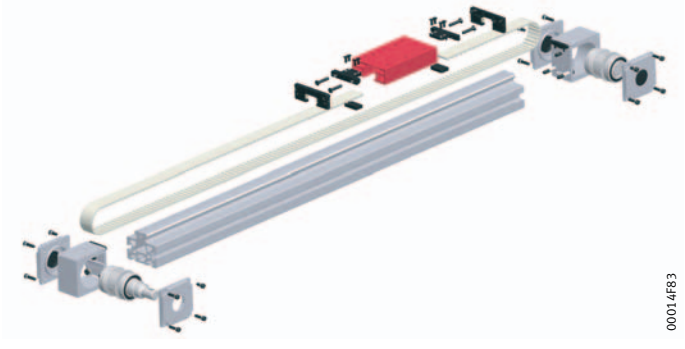
Return unit



Replacement parts list for return unit

Linear actuator	Designation	MATNR
MLF32-ZR	UML.MLF32-ZR-7500	000049395-0000
MLF52-ZR	UML.MLF52-ZR-7500	001189840-0000

Carriage

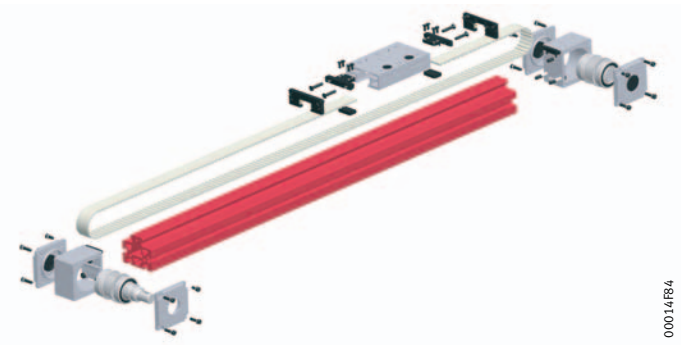


Replacement parts list for carriage

Linear actuator	Designation	MATNR
MLF32-ZR		
Carriage length 155 mm	LFKL.MLF32-ZR-4400	000556106-0000
Carriage length 300 mm	LFKL.MLF32-300-ZR-4400	003369188-0000
MLF52-130-ZR		
Carriage length 200 mm	LFKL.MLF52-130-ZR-4400	001189794-0000
Carriage length 300 mm	LFKL.MLF52-130-300-ZR-4400	003369072-0000
MLF52-145-ZR		
Carriage length 245 mm	LFKL.MLF52-145-ZR-4400	000082430-0000
Carriage length 500 mm	LFKL.MLF52-145-500-ZR-4400	003369056-0000
MLF52-155-ZR		
Carriage length 260 mm	LFKL.MLF52-155-ZR-4400	000082481-0000
Carriage length 500 mm	LFKL.MLF52-155-500-ZR-4400	003369030-0000

# Replacement parts

## Support rail



## Replacement parts list for support rail

Linear actuator	Designation	MATNR
MLF32-ZR	LFS.MLF32-ZR-4700	000595829-0000
MLF52-ZR	LFS.MLF52-ZR-4700	000479314-0000

# Appendix

**Accessories** Special INA replacement parts have been developed for the linear actuators named on the title page. These ensure the reliable and long term function of the linear actuators.

## Location

Accessory	Article number
Clamping lugs <sup>1)</sup>	SPPR28x30
Fixing brackets <sup>1)</sup>	WKL48x35
	WKL98x35
T-strips (steel)	Leis-M6-T-Nut
	Leis-M8-T-Nut
T-nuts	MU-DIN508-M4x8
	MU-DIN508-M6x8
	MU-M4x8-Rhombus
	MU-M6x8-POS
	MU-M6x8-Rhombus
	MU-M8x8-POS
T-bolts	SHR-DIN787-M8x8x32
Slot closing strips	NAD8x11,5
Connecting brackets	See INA publication Fasteners and connecting brackets for linear actuators (TPI 153)

<sup>1)</sup> Clamping lugs can support higher forces. They should be used in preference over fixing brackets.

## Appendix

### Coupling, gearbox, motor

As a system supplier, the Schaeffler Group also offers components including coupling housings, couplings, gearboxes and motors. These components are precisely matched to the linear actuator.

#### MLF32-ZR

Coupling	Coupling housing	Gearbox and motor <sup>1)</sup>
KUP-560-56-16H7/20H7	KGEH32/43 000-MLF-ZR	GETR-PL70-i
KUP-560-56-20H7/20H7	KGEH32/43 100-MLF-ZR	GETR-PL90-i
KUP-560-56-20H7/20H7	KGEH32/43 100-MLF-ZR	GETR-PLE80/90-i
KUP-560-56-19H7/20H7	KGEH32/36 200-MLF-ZR	MOT-SMH100 ...

<sup>1)</sup>  $\overline{i}$  = ratio

#### MLF52-ZR

Coupling	Coupling housing	Gearbox and motor <sup>1)</sup>
KUP-560-56-16H7/20H7	KGEH52/43 000-MLF-ZR	GETR-PL70-i
KUP-560-56-20H7/20H7	KGEH52/43 100-MLF-ZR	GETR-PL90-i
KUP-560-56-20H7/20H7	KGEH52/43 100-MLF-ZR	GETR-PLE80/90-i
KUP-560-56-20H7/24H7	KGEH52/36 000-MLF-ZR	MOT-MH145 ...

<sup>1)</sup>  $\overline{i}$  = ratio

Comprehensive information can be found in INA publication ALE, Driven Linear Units and on the Internet at [www.schaeffler.com](http://www.schaeffler.com)

**Tightening torques**      The correct tightening torques are shown in the table.

Screw	Grade	Tightening torque Nm
M4	8.8	2,7
	10.9	4,3
	12.9	5,1
M5	8.8	5,5
	10.9	8,4
	12.9	10,2
M6	8.8	9,5
	10.9	14,7
	12.9	17,6
M8	8.8	23
	10.9	35,3
	12.9	42,2
M10	8.8	46
	10.9	67
	12.9	78
M12	8.8	80
	10.9	115
	12.9	135

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